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SCIENCE 7

Module 3 Heat and Temperature

Home Instructor's Guide and Assignment Booklet 3B

Learning Technologies Branch

Alberta LEARNING

Science 7
Module 3: Heat and Temperature
Home Instructor's Guide and Assignment Booklet 3B
Learning Technologies Branch
ISBN 0-7741-2458-X

The Learning Technologies Branch acknowledges with appreciation the Alberta Distance Learning Centre and Pembina Hills Regional Division No. 7 for their review of this Home Instructor's Guide and Assignment Booklet.

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Home Instructors	✓
General Public	
Other	

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Section 3: Using Thermal Energy Effectively

This section is about using resources for thermal energy and using these resources effectively and with minimal impact on the environment. Fossil fuels are limited—eventually they will be used up. The student evaluates different sources of thermal energy—such as coal, gas, oil, solar, and wind—and the environmental impacts of their use. The student then compares the input energy needed for various thermal technologies and considers the safety of these technologies. Cooking methods differ in how efficiently energy is used. The student identifies unintended consequences of energy use—global warming and pollution—and discovers ways to reduce the use of energy resources.

In dealing with issues related to the thermal energy and fossil fuels, the student discovers that there is more than one way to look at things and that it is important to respect other people's perspectives.

The following materials will be needed to complete this section.

Section 3: Lesson 1

- 2 identical glass jars
- water
- 10 ice cubes
- clear, glass lid (or a clear, plastic bag)
- thermometer

Section 3: Lesson 2

- 3 tin cans (about 284 mL)
- water
- newsprint
- masking tape
- heat source (e.g., stove, hot plate)
- thermometer
- 500-mL beaker (or small pot)

Suggested Answers

Section 3: Lesson 1

16. a. **Textbook questions 2 and 3 of "Analyze," p. 246**

    2. The thermometer in the closed container has the greatest temperature change because radiant light energy enters the glass container. It is absorbed and converted into thermal energy. Once converted, the energy can only escape by conduction through the glass (a much slower process). In the open container, heat can escape by conduction and convection (the major form of heat transfer in fluids).

    3. The temperature of Earth's atmosphere will continue to rise unless the greenhouse gases are reduced.

b. **Textbook question 4 of "Conclude and Apply," p. 246**

4. The glass lid acts like greenhouse gases in that it prevents heat from escaping.

18. **Textbook questions 4 and 5 of "Topic 7 Review," p. 247**

4. The greenhouse effect is a heating of the Earth caused by certain gases keeping heat from going off into space. One such gas is carbon dioxide. If there are abnormal levels of these gases, the average temperature on Earth will go up. This would lead to climate change, sea level change, and other problems.

5. Most Alberta geothermal sources are in protected parks, like Banff National Park. Also, good-quality coal is readily available, thus making it cheaper to use.

Section 3: Lesson 2

2. a. **Textbook questions 2, 4, and 5 of "Analyze," p. 249**

2. Likely taking a shower would use less hot water. By using less water, you save energy:

- heating the water
- transporting water to your house
- running the water treatment plant

4. Your dishes and clothes may not come clean because the water temperature was set too low. If the thermostat is set too high, you run the risk of accidental burns. This is particularly true with infants.

5. Positive effects would include lower energy costs and, if the thermostat on the hot-water heater is turned down, it may be safer. The benefits to the community would include less fossil fuels being used, causing less pollution, and lower water treatment costs.

b. **Textbook questions 1, 2, and 3 of "Extension," p. 249**

1. Answers will vary. It is likely that most students will underestimate the length of their showers.

2. The more hair products and other products used in the shower, the longer the shower will take.

3. Answers will vary. One activity that involves using hot water is washing clothes. To be more energy efficient, you could wash larger loads. You could also use a cold water rinse and/or wash for each load.

11. **Textbook questions 1 to 4 of "Topic 8 Review," p. 256**

    1. Fossil fuels are energy sources used to generate electricity, run vehicles, and heat homes. They are plentiful in Alberta, thus making them very affordable.

    2. Fire, burns, soil contamination, air and water pollution, and carbon monoxide poisoning are some of the dangers involved when thermal energy is used.

    3. If sulfur dioxide is not removed, it would combine with the water in the atmosphere and produce acid precipitation (rain, snow, or fog). It would also irritate the moist membranes of the body.

    4. a. Carbon monoxide forms when there isn't enough oxygen available when burning organic matter.

       b. Carbon monoxide is colourless and odourless. It can build up in a person's system, causing confusion and flu-like symptoms and eventually death.

12. a. Answers will vary. Some of the major considerations would be

       - gas emissions from the plant
       - effect on local soil and waterways
       - increased use of roads and infrastructures to and from the plant

    b. The plant was located close to the city because the electricity produced was intended to service a portion of the city near the plant. This would mean less cost to transport electricity from the source to the destination. Also, there would be a large labour market that could be hired to build and run the plant.

13. The price of electricity would probably decrease because there would be more electricity on the market and it would cost less to transport the electricity.

14. a. Answers will vary. Reasons why local residents may be upset with the prospect of having the plant close to their homes are as follows:

       - danger of increased pollution in air, soil, and water
       - concern over the aesthetics of having the plant too close, thus decreasing property values
       - increased traffic on local roads

15. Answers may vary. Reasons should be plausible.

    Mrs. Olinski may be in favour of the new power plant for some of the following reasons:

    - The emission from a power plant running on natural gas is likely cleaner than one running on coal.
    - Having the power plant nearby will provide jobs for local residents.
    - Local roads needed to service the plant will be upgraded to handle increased traffic.
    - Having another power plant in the province will make power shortages less likely.
    - The waste heat from the power plant will eventually be made available for the heating of nearby homes.

16. a. There is no way of knowing if the information is reliable. You can make judgments based on what you already know, the reputation and credentials of the source, how current the information is, the type and amount of backup information that is provided, biases of the source, the amount of quantitative information provided, the techniques and controls used to obtain the information, and so on.

    b. You would want to check other websites and cross-reference your findings with other, more recent data from magazines, expert sources, and books. Keep an open mind as you consider information from a variety of perspectives.

17. a. Answers will vary. Sample answers are given.

    A person who likes to camp in off-road areas may not be in favour of the bill because they most likely use their vehicle to access these off-road areas. However, those who hike or bike into these off-road areas may support the bill in an effort to keep vehicles out of the natural areas.

    b. A gas station owner may not support the bill because SUVs use a lot of fuel. Fewer SUVs means decreased gas sales.

    c. A person concerned with the environment would probably be in favour of the bill as it would decrease pollution.

    d. Other than personal preferences, the bill may not matter to a salesperson at a dealership because people will just switch to buying other available vehicles. However, the profit margins on SUV's may be higher than on other vehicles.

18. Answers will vary. Some might consider the fact that there is only a certain amount of fossil fuel left and that people no longer have the right to be excessive just because they can afford to. On the other hand, some may agree that if you have the money to purchase the SUV and its fuel that should be the most important consideration. Others may mention non-monetary costs, like pollution.

19. This is an opinion, so answers will vary. The student should have reasons to back up his or her opinions.

20. Actions citizens could take could include the following:

    - writing letters of concern to their MLA, the Minister of Energy (federal), their MP, the Premier, and/or the Prime Minister
    - writing letters asking for support from the Opposition
    - asking for a meeting with their MLA or MP
    - peaceful demonstrations
    - seeking support of other groups to lobby the government
    - refusing to buy an SUV

21. If bike use is increased, it will help reduce vehicular congestion, reduce dependency on fossil fuels, increase air quality in the city, and promote human health and physical fitness.

22. Answers will vary. Sample answers are given.

    a. A bicycle owner may agree with the action taken by the city. It would make it easier, faster, and safer to get around the city on a bicycle.

    b. A taxpayer who does not ride a bicycle may not support the plan because he or she does not gain any direct benefit from it. However, he or she may approve it to support reducing fossil fuel emissions. They may also feel that the roads would be less congested and last longer.

    c. A construction company bidding for the contract would probably be in support of the project.

    d. A salesperson at a car dealership may have concern with the project because if more people ride bikes, car sales may decrease. However, he or she may approve it because to support reducing fossil fuel emissions or may feel that most people will need a vehicle anyway.

Section 3: Review

1. **Textbook question 1 of "Reviewing Key Terms," p. 257**

    1. a. active solar heating (not defined): solar heating that uses mechanical devices to absorb and distribute energy from the Sun

    b. non-renewable resources: Fossil fuels are this kind of resource.

    c. thermal pollution: undesirable effect of thermal energy

    d. refrigerant: liquid that easily evaporates at cold temperatures

    e. solar energy: energy that depends on the Sun

    f. fossil fuels: an important resource in Alberta

    g. resource (not defined): an available supply of certain materials

    h. cogeneration: technique for using unwanted thermal energy

    i. wind energy (not defined): energy that is harnessed from moving air

    j. greenhouse gases: prevent heat from escaping into outer space

    k. solar collectors: a means of trapping the Sun's energy

    l. renewable resources: energy that will never run out (with appropriate monitoring and care)

    m. passive solar heating: solar heating without fans or motors

    n. geothermal energy: energy inside Earth

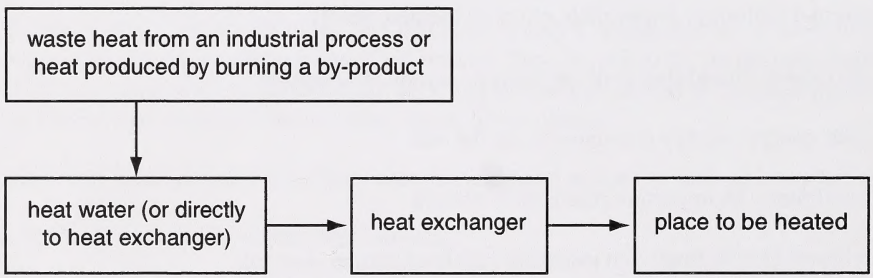
2. **Textbook questions 2 to 10 of "Understanding Key Concepts," p. 257**

2.

Type of Energy	Renewable or Non-renewable
chemical	non-renewable—burning fossil fuels (like coal, oil, and natural gas) renewable—burning wood or food
electrical	renewable—hydroelectric energy non-renewable—coal-burning electric plants
solar	renewable
wind	renewable
geothermal	renewable
mechanical	renewable

3. The windmill is a turbine. It converts wind (kinetic energy) into electrical energy by rotating an electrical generator.

4. Diagrams will vary. A sample diagram is given.


waste heat from an industrial process or heat produced by burning a by-product
heat water (or directly to heat exchanger)
heat exchanger
place to be heated

5. Radiant light energy enters the car through the glass windshield and windows. It is absorbed and converted into thermal energy. The thermal energy is absorbed by the air particles in the car and is unable to escape. The inside of the car heats up to a dangerous temperature, which can be harmful to the pet.

6. The advantages of a solar cooker are as follows:

    - no further energy inputs once it is built
    - no pollution
    - relies on a renewable energy source
    - does not impact fossil fuel reserves
    - often very portable and light weight
    - great to have as part of a survival pack

    The disadvantages of a solar cooker are as follows:

    - needs a lot of sunlight to cook food at safe temperatures
    - needs a lot of time to cook food
    - hard to be accurate when cooking will be finished because temperatures may fluctuate
    - only works on sunny days

7. No, all energy resources require some inputs, and these inputs translate into a cost (financial, environmental, personal, and material).

8. A refrigerator is called a thermal energy mover because it moves thermal energy from one location to another. It moves it from the inside of a closed compartment to the outside (at the back of the refrigerator) and then to the air. It uses the processes of evaporation and condensation.

9. Combustible means that a substance is capable of being burned. Fossil fuels are substances that are combustible. During the process of combustion, heat is given off (usually in large quantities).

10. Answers will vary. Knowledge, awareness, and good modelling of energy conservation techniques can go a long way toward improving other people's attitudes and choices.

Module Summary

1. **Textbook questions 1 of "Understanding Key Concepts," p. 262**

    1. The ice melts first and then the water evaporates, leaving nothing visible where the ice block first stood.

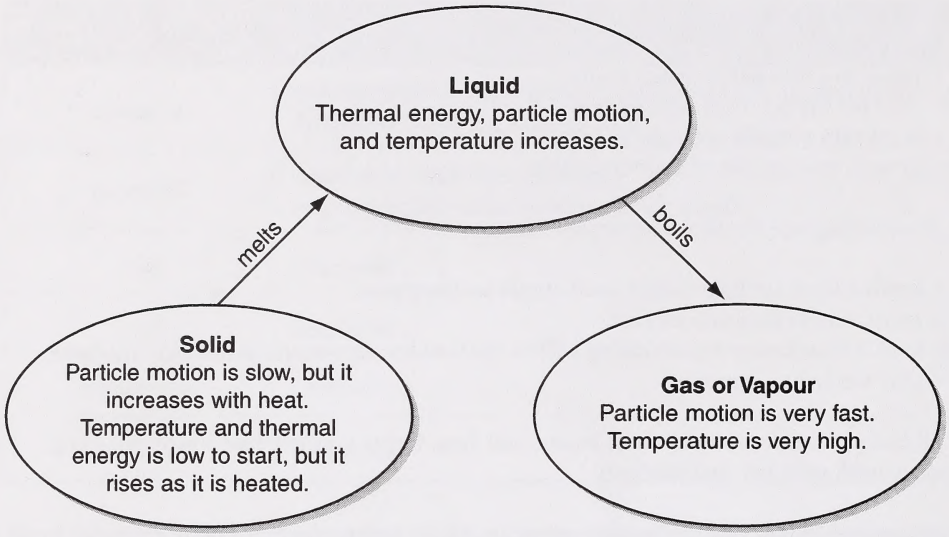
        a. The thermal effects include the block of ice absorbing heat by conduction from the air and the pavement, as well as radiant heat and light from the Sun. This caused the block to change state from a solid to a liquid (melting). Then as the liquid absorbed more heat from the same sources, it caused it to change from a liquid to a gas (evaporation).

        b. The solid and liquid water absorbed heat by conduction from the air and the pavement, as well as radiant heat and light from the Sun.

        c. The energy was absorbed by the particles in the solid or liquid water. This energy caused the particles to vibrate faster and hit each other harder. As individual particles gained enough energy to overcome the attractive forces of the other water particles, they escaped and changed state.

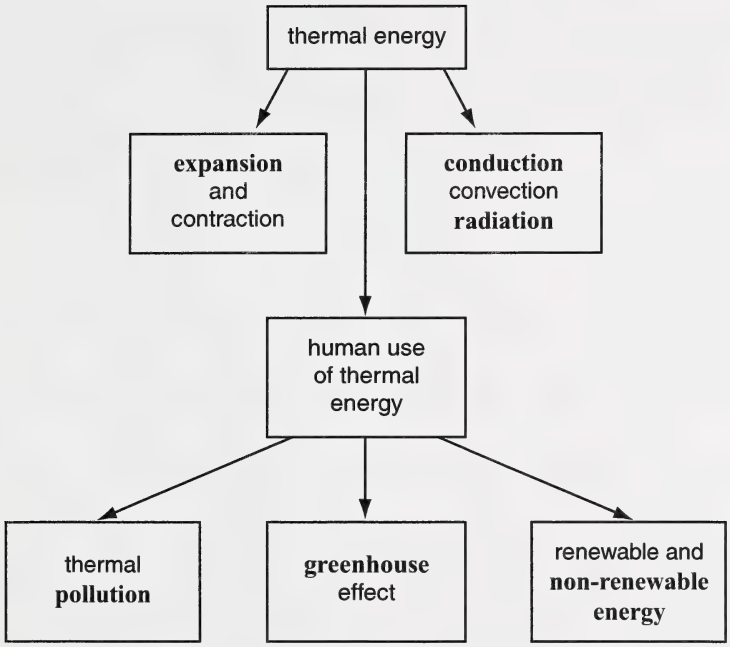
2. **Textbook questions 3, 4, and 5 of "Developing Key Skills," p. 263**

3.


Liquid
Thermal energy, particle motion, and temperature increases.
melts
boils
Solid
Particle motion is slow, but it increases with heat. Temperature and thermal energy is low to start, but it rises as it is heated.
Gas or Vapour
Particle motion is very fast. Temperature is very high.

4. As the wax heats up, the particle will vibrate faster and faster. At some point it will have absorbed enough energy to escape from the other solid particles. The solid will remain at its melting point as long as particles are using the energy to escape into the liquid phase. The now liquid particle will again use the absorbed energy to increase its speed. It will move faster and faster and hit harder and harder. During this phase, the temperature of the liquid wax will increase. Your particle will reach a point where it has enough energy to escape the attractions of the other liquid particles. It will move away from the others, becoming a gas. During this phase change, the liquid wax will not change temperature. Once the particles (including yours) have become a gas, absorbed energy is used to increase motion. Soon the particles will reach their ignition point; then "poof," they will be rearranged into other types of particles in the combustion (burning) process.

5.



3. **Textbook question 7, 8, 11, 13, and 14 of "Problem Solving/Applying," pp. 263 and 264**

7. a. A recording thermometer should be used because a liquid thermometer would freeze.

   b. A thermostat with a bimetallic strip should be used. The bimetallic strip will expand and contract with temperature changes.

   c. A thermocouple should be used because it is able to work at very high temperatures.

8. Your story should include following points:

   - The particles are moving slowly in the refrigerator and are close together.
   - When the particles are heated in a microwave, they start to move faster and spread out.
   - If the particles are heated enough, they will gain enough energy to escape the liquid stage and become vapour.
   - When left to cool on the kitchen counter, the particle motion slows down and the particles move closer together.

11. a. As you play beach volleyball, your body generates heat because your muscles are converting chemical energy into mechanical energy. The signal your brain would receive is that your core body temperature is starting to rise and the signal sent out would be to start sweating.

    b. When ice-fishing, your body would be losing heat to the environment faster than it is making it. Your brain would receive a signal that you are getting cold. It would send out a signal to start converting more chemical energy to mechanical energy and you would start to shiver.

13. Answers will vary. Energy transformations include the following:

    - Chemical energy in the wood is converted into light and heat energy (some sound).
    - Chemical energy in the food (hot beverage) is converted into thermal energy and mechanical energy.
    - Thermal energy in the hot beverage is transferred to the girl.
    - Thermal energy of the fire is transferred to the stick.
    - Thermal energy of the body and the cup is transferred to the atmosphere and converted into kinetic energy of air particles.

14. a. Water and antifreeze would be the best choice of liquids because antifreeze has a high specific heat capacity and can absorb and retain large amounts of heat. Water will allow the antifreeze to flow more easily. Water alone freezes and evaporates too easily. Alcohol evaporates and boils at lower temperatures than water. Also, gaseous alcohol is flammable. Any leakage would pose a fire hazard.

    b. Answers will vary. The material with the highest specific heat capacity would be the best material for storing thermal energy. From everyday experience, materials like brick and stone heat and cool more quickly than water. Therefore, water has a higher specific heat capacity and would be the best material for storing thermal energy.

4. **Textbook questions 19, 20, 21, and 23 of "Critical Thinking," pp. 264 and 265**

19. Paper burns when its temperature rises to about 230°C. This is called the flashpoint or ignition point. However, if the paper contains water, the water absorbs energy from the paper preventing it from getting hot enough to burn. The water never gets hotter than 100°C as that is the temperature at which it boils. If the water all boils away, the bag will not be around for long.

20. The plants and trees in the park produce oxygen as a by-product of photosynthesis. Therefore, if they are cut down, there is less oxygen available for other living things. Plants use carbon dioxide, thus removing this greenhouse gas from the air. Also, trees and plants have been shown to filter pollution and improve air quality. They are extremely important in that they return water that has been lost below the surface of the ground to the atmosphere through transpiration.

21. The device is a recording thermometer. It works on the basis of expansion and contraction of the bimetallic coil to which the pen is attached. As the coil expands and contracts with the varying temperatures, the pen moves up and down on the rotating drum and provides a permanent, long-term record of the temperature fluctuations. It would be best used in situations where a record over a period of days or months is needed.

23. Answers will vary.

    Positives of using a barbecue include the following:

    - It cooks food fast; therefore, less gas required.
    - You cook outside, so there is no heat transfer to the kitchen.

    Negatives of using a barbecue include the following:

    - Carbon monoxide is given off. Even though it is not much, think of the number of barbecues there are.
    - They are fire hazards.
    - They can be dangerous if used in enclosed areas.

ASSIGNMENT BOOKLET 3B

Science 7
Module 3: Section 3 Assignment and Final Module Assignment

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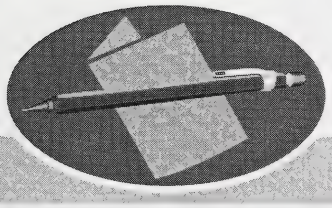
Science 7

Module 3

Heat and Temperature

Assignment Booklet 3B



Learning Technologies Branch

Alberta LEARNING

FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Section 3 Assignment	50	
Final Module Assignment	66	
	116	

Teacher's Comments

Science 7
Module 3: Heat and Temperature
Assignment Booklet 3B
Learning Technologies Branch

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Students	✓
Teachers	✓
Administrators	
Home Instructors	
General Public	
Other	

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ASSIGNMENT BOOKLET 3B
SCIENCE 7: MODULE 3
SECTION 3 ASSIGNMENT AND FINAL MODULE ASSIGNMENT

Your mark for this module will be determined in part by how well you do your assignments.

This Assignment Booklet is worth 116 marks out of the total 209 marks for the assignments in Module 3. The value of each assignment and each question is stated in the left margin.

Work slowly and carefully. If you have difficulty, go back and review the appropriate topic.

Be sure to proofread your answers carefully.

50

Section 3 Assignment: Using Thermal Energy Effectively

Read all parts of your assignment carefully and record your answers in the appropriate places.

Read question 1 carefully. Decide which of the choices BEST answers the question. Place your answer in the blank space given.

(1)

_____ 1. Homes with active solar heating need to absorb energy from sunlight. Which surface would be best for the solar collector?

A. shiny white
B. dull white
C. shiny black
D. dull black

(4)

2. Humans use heat from many sources. Over the centuries, the choices have expanded. A list of heat sources is given. Use them to fill in the following chart. (Some items may not be used.)

- coal
- electricity
- oil
- wood
- natural gas
- sunlight

Not Likely Found in the Average Home 200 Years Ago	Not Likely Found in the Average Home Today

(3) 3. Which of the following are examples of passive solar heating? Mark them with the letter P.

_____ Your living room is warmed by the Sun on a cold winter day.
_____ Shower water is heated in a black bag hung out in the Sun.
_____ A toaster is powered by electricity from a solar panel.

(2) 4. Describe the major difference between passive and active solar heating.

_____

_____

(3) 5. There is a hot container in the oven. It contains your supper. Explain how you would remove it from the oven without burning yourself.

_____

_____

_____

(2) 6. Why would a stainless steel mug be a bad choice for drinking hot coffee?

_____

_____

(7) 7. Match each type of energy to the associated term that best suits it. Write the letter of the associated term on the line next to the matching energy type.

Type of Energy	**Associated Term**
_____ chemical	a. Banff Hot Springs
_____ thermal	b. a shock
_____ geothermal	c. a steak
_____ light	d. a waterfall
_____ kinetic	e. the Sun
_____ electrical	f. friction
_____ gravitational	g. wind

(3) 8. Explain how the greenhouse effect and global warming are related.

Return to page 78 of the Student Module Booklet and begin Lesson 2.

(3) 9. List three properties that make a substance a good insulator.

(3) 10. Create a graphic organizer that links the following:

- air pollution
- solar energy
- warm homes
- expensive oil
- costly electricity
- high-priced natural gas

(9) 11. The following chart shows methods of heating homes used over the years.

"Efficiency" means how much of the heat actually warms the home. Rate the methods from 1 to 3, where 1 is the least efficient and 3 is the most efficient.

"Safety Issues" means what dangers are there in using this heating method. Give at least one unique danger for each method.

"Pollutants" means what products of burning cause environmental problems. Give at least one for each heating method.

Heating Method	Efficiency	Safety Issues	Pollutants
open fireplace			
coal stove			
gas furnace			

Return to page 81 of the Student Module Booklet and continue with Lesson 2.

Read question 12 carefully. Decide which of the choices BEST answers the question. Place your answer in the blank space given.

(1) _____ 12. You need to put a handle on a frying pan. You have several materials you can choose from. Which of these would make the best handle?

A. copper
B. brass
C. steel
D. wood

(2) 13. Why would the material you chose in question 12 be the best choice?

_____

_____

14. There always seems to be a need for more electricity. The energy to drive a generator can come from many sources. There are good and bad points about most energy sources. For each source below, give one of each.

(2) **Coal**

Advantage: _____

_____

Disadvantage: _____

_____

(2) **Natural Gas**

Advantage: _____

_____

Disadvantage: _____

_____

(2) **Wind**

Advantage: _____

_____

Disadvantage: _____

_____

Return to page 84 of the Student Module Booklet and continue with Lesson 2.

(1) 15. You gather a large clump of fluffy snow in your thick, warm mitts and squeeze really hard. The fluffy clump compresses into a snowball. As you continue to squeeze, some of the snow melts and then solidifies, turning your snowball into an ice ball. What energy transformation must have taken place?

_____

_____

Return to page 91 of the Student Module Booklet and begin the Module Summary.

(66)

Final Module Assignment

Read all parts of your assignment carefully and record your answers in the appropriate places.

1. It is a chilly day. You are wearing warm, wool and leather mittens, but you forgot your scarf. Your hands are warm, but your cheeks are very cold.

(2) a. Explain why your fingers are warm on such a cold day.

_____

_____

_____

(1) b. Explain why your cheeks would get warmer if you held your mittens against them for a while. Assume your hands are still in your mittens.

_____

_____

(1) c. Explain why your cheeks would get even warmer if you removed your mittens and held your hands against them.

_____

_____

(2) 2. Marco slowly enters a swimming pool. He thinks the water is too cold for swimming. After a few minutes of fun in the pool, he thinks the temperature is just fine. Explain why he changed his mind.

(3) 3. Alberta's economy is based on harnessing, selling, and distributing fossil fuels to other provinces and countries. However, many scientists and economists are urging Albertans to invest in other businesses. Provide three reasons why this would be a good idea based on the concepts from this module.

4. Name the **type** of energy (chemical, geothermal, kinetic, mechanical, solar) that serves as the initial source in each of the following situations:

(1) a. The Bar Z ranch relies on several pumps to supply cattle with water. Located in remote areas, these pumps rely on the natural convection currents in the atmosphere as their energy source.

(1) b. Modern construction safety signs in areas that do not allow easy access to electricity often have devices that absorb and convert this type of energy into chemical energy stored in a rechargeable battery. The battery then converts the chemical energy into electrical energy to light the bulbs in the sign. The battery can store enough energy to run the sign all night.

(1) c. In Iceland, hot water is piped directly from volcanic areas into homes and commercial buildings. The thermal energy from this source is very inexpensive and non-polluting.

(1) d. Moist grain is stored in a granary. Two weeks later, a wandering mouse finds the grain to be very warm. Three weeks later, the granary bursts into flame.

_____

(1) e. It is a cool day. A long train has just passed by; then Carlos touches the rails and finds they are quite hot.

_____

(3) 5. List three different, specific reasons why you should be concerned about energy conservation.

_____

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6. Karen attended a public meeting sponsored by the Alberta Energy and Utilities Board to clarify some concerns about an electricity project proposed for her area. She asked if there would be any negative impacts on the air, water, or soil quality. The government spokesperson said that there would not be any.

(3) a. List three things Karen can do to verify the spokesperson's answer and come to her own decision on the issue.

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(3) b. After careful research and consideration, Karen decided she did not want the plant to be built in her area. List three different, specific actions she can take to promote her opinion.

_____

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_____

7. Read through the following statements regarding convection currents in fluids using the particle model of matter. Fill in the blanks and circle the correct bolded term where specified. An example is done for you. **Note:** Each paragraph is a continuation of the preceding one.

Example: When the particles of a **fluid** (a liquid or a gas) touch a warmer surface, they **gain** / **lose** thermal energy by **conduction**.

(5) a. As a substance warms up, the particles move **faster / slower** and hit each other _____. As a result, the spaces between the particles get _____, causing the density of the substance to **increase / decrease**. Due to the change in density, the warmed substance becomes **heavier / lighter**.

(3) b. The _____, denser, **heavier / lighter** fluid surrounding the warmed particles flow downward and _____ the warmed particles up and away from the heat source.

(5) c. As the particles move upward, they lose _____ energy to the environment. As a result, the substance becomes **warmer / colder**, its particles move **faster / slower**, and they begin to move **closer together / farther apart**, causing a(n) **increase / decrease** in density.

(3) d. The substance gradually becomes **heavier / lighter** and begins to sink, forcing **warmer / colder** fluid up from the heat source. A convection _____ then forms.

(2) e. This circular flow will continue as long as there is a _____ in temperature within the substance. The **larger / smaller** it is, the faster the energy transfer.

8. Complete the following.

(1) a. As temperature decreases, volume _____.

(1) b. As mass increases, thermal energy _____.

(1) c. As average energy level increases, density _____.

(1) d. When the temperature plateaus on a cooling curve, the average energy level of the particles _____.

(2) e. The more energy that must be released to cool an object 1°C, the _____ its _____ capacity.

(1) f. As altitude increases, the boiling point of a liquid _____.

9. Sven pours 200 mL of water into five identical containers. He then stirs 10 mL of sugar in the first container, 20 mL in the second container, 30 mL in the third container, 40 mL in the fourth container, and 50 mL in the fifth container. He stirs the water in each container until the sugar completely disappears (dissolves). Sven then lines up the containers in the freezer. Every half hour, Sven checks the containers and records the time when each solution of sugar water completely freezes.

(2) a. Write a proper scientific question for his investigation.

_____

_____

(2) b. Write an appropriate scientific hypothesis for his investigation.

_____

_____

(2) 10. A blow dryer converts 1000 J of energy into heat, sound, and kinetic energy. How will the energy output from the blow dryer compare to the energy input? Explain.

_____

_____

_____

_____

(3) 11. Emil's aunt carved him a beautiful wooden piggy bank specifically designed for saving two-dollar coins. The coins just barely scraped through the slot in the top of the bank. A year later, Emil decided to deposit his savings in the bank. Unfortunately, the coins were extremely difficult to shake out through the slot and there was no other opening in the piggy bank. He did not want to damage his aunt's gift. How could he make it easier to remove the coins? Explain why.

(2) 12. Certain tropical areas of the world are famous for their black sand beaches. One hotel decides to be different and imports tonnes of white sand to cover its beachfront. Predict what you would experience as you walk along this beach past the various hotels. Explain your reasoning.

(1) 13. The temperature in Tasha's self-defrosting freezer is maintained at –10°C. She leaves on holidays for a month. When she returns, Tasha discovers that the ice cube trays, which were filled with water just before she left, contained only small chips of ice instead of the expected cubes. Explain what happened to Tasha's ice cubes.

14. Identify the method and direction of thermal energy transfer.

(2) a. A glass of juice feels cold.

(2) b. John keeps three pigs, five chickens, a horse, and a cow in one room of his two-room barn. A door of chicken wire kept the animals out of the other room that John uses for storage. When John returned to the barn one cold, winter evening, he noticed that the storage room was quite warm even though the heater had been off all day.

(2) 15. Why are open fireplaces considered a bad way to heat your home?

Submit Assignment Booklet 3B to your teacher for assessment.

ASSIGNMENT BOOKLET DECLARATIONS

The Student's Declaration is to be signed by a student registered at the Alberta Distance Learning Centre. If the student is under 16, the Supervisor's Declaration is to be signed by the student's supervisor, who is usually a home instructor, teacher, or home-schooling coordinator. Failure to complete this page may invalidate the assignment results.

STUDENT'S DECLARATION

- I have followed the instructions outlined in the Student Module Booklet.
- I have completed the activities to prepare myself for the assignments in this Assignment Booklet.
- I completed the assignments in this Assignment Booklet by myself.

_____

Student's Signature

SUPERVISOR'S DECLARATION

I hereby certify that I have supervised the learning activities completed by _____.

Student's Name

I also certify that to the best of my knowledge the assignments in this Assignment Booklet were completed independently by this student.

_____

Supervisor's Signature

If you, the student or supervisor, have any comments or observations regarding this module, write them in the following space.

_____

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